CLAIMS:

1. An adaptive line enhancer comprising an adaptive Gray-Markel lattice notch filter having an adaptive notch frequency, in which the notch frequency is determined according to a notch frequency variable k,
characterized in that
a value of k for the n+1th sample period is determined according to the following equation:

$$k(n+1) = k(n) - \mathrm{sgn}[y(n)]\,\mathrm{sgn}[UPDATEFN] \times \mu$$

in which y(n) is a notch filter output, μ is an adaptation constant, and *UPDATEFN* has a transfer function in the z-transform domain of:

$$\frac{(\alpha-1)(k(n)-1)z^{-1}}{1+k(n)(1+\alpha)z^{-1}+\alpha z^{-2}}$$

in which α determines a bandwidth and k(n) is a variable for determining a current notch frequency.

2. An adaptive line enhancer according to claim 1, in which the Gray-Markel lattice notch filter is a wave digital lattice filter.

3. An adaptive line enhancer according to claim 2, in which the wave digital filter comprises a first dynamic adapter (310) having a first input from an input, a second input and an adaptive coefficient input from a bandwidth determining block (335),
a first summing block (320) for receiving the input signal and a first output from the first dynamic adapter (310) and summing the same,
an amplifier block (325) for amplifying the output of first summing block (320) to an output,
a second dynamic adapter (315) for receiving a first input from a third output of first dynamic adapter (310), a first output providing a second input to first dynamic adapter, a second

output, a third output providing an input to second input of second dynamic adapter (315) and an adaptive coefficient input.

4. An adaptive line enhancer according to claim 3, in which the first and second dynamic adapters (310, 315) comprise a first input, a second input, an adaptive coefficient input, a first subtracter (240) for subtracting the second input from the first input, a multiplier (250) for multiplying the output of subtracter by the adaptive coefficient input, a second subtracter (260) for subtracting the second input from the output of multiplier, and a third subtracter (270) for subtracting the first input from the output of multiplier, in which a first output is provided by the output of second subtracter (260), a second output is provided by the output of third subtracter (270) and a third output is provided by the output of third subtracter having been delayed by a delay block (280).

5. An adaptive line enhancer according to claim 3, in which the adaptive coefficient input for the second dynamic adapter (315) is provided by a first signum function block (345) for receiving the second output from second dynamic adapter (315), a second signum block (350) for receiving the output from the amplifier block (325), a first multiplier (355) for multiplying the outputs of the first and second signum blocks, an adaptation speed determining block (365) for generating an output to determine a speed at which the desired frequency is locked on to, a second multiplier (360) for multiplying the outputs of the first multiplier (355) and the adaptation speed determining block (365), a second summing block (370) for summing the output of second multiplier (360) and the output of a notch frequency determining block (340), an amplitude limiting block (375) for clipping an output k(n+1) of second summing block (370) within range]-1 1[, and a delay block (380) for delaying an output of the amplitude limiting block (375), an output of the delay block (380) comprising the adaptive coefficient input and the updated value of the notch frequency determining block.

6. A method for adaptive line enhancement, comprising adaptive line enhancing an adaptive Gray-Markel lattice notch filter with an adaptive notch frequency, in which the notch frequency is determined according to a notch frequency variable k, characterized in that

a value of k for the $n+1^{th}$ sample period is determined according to the following equation:

$$k(n+1) = k(n) - \mathrm{sgn}[y(n)]\mathrm{sgn}[UPDATEFN] \times \mu$$

in which y(n) is a notch filter output, μ is an adaptation constant, and UPDATEFN has a transfer function in the z-transform domain of:

$$\frac{(\alpha-1)(k(n)-1)z^{-1}}{1+k(n)(1+\alpha)z^{-1}+\alpha z^{-2}}$$

in which α determines a bandwidth and k(n) determines a current notch frequency.

7. A method for adaptive line enhancement according to claim 6, in which the Gray-Markel lattice notch filter is a wave digital lattice filter.

8. A method for adaptive line enhancement according to claim 6, in which the method is according to the adaptive line enhancer of claim 3.

9. A method for adaptive line enhancement according to claim 8, in which the first and second dynamic adapters are according to claim 4.

10. A method for adaptive line enhancement according to claim 8, in which the adaptive coefficient input for the second dynamic adapter is according to claim 5.